The Nymphal Development of the Predatory Bug *Orius majusculus* (Reuter) (Heteroptera: Anthocoridae) Reared on four Aphid Species

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Abstract

HEJZLAR P., KABÍČEK J. (2000): **The nymphal development of the predatory bug** *Orius majusculus* (Reuter) (Heteroptera: Anthocoridae) **reared on four aphid species**. Plant Protect. Sci., **36**: 91–94.

The nymphal development of *Orius majusculus* (Reuter), a predatory anthocorid bug, when reared on four aphid species at 25 ± 1°C, 75 ± 5% RH and a photoperiod of 16L:8D was examined. The shortest nymphal development time on the prey was reported on *Phorodon humuli* Schrank – 13.8 days, and *Aphis schneideri* (Borner) – 14.5 days, while the longest nymphal development time was on *Aphis pomi* (De Geer) – 15.3 days and *Dysaphis plantaginea* (Passerini) – 15.3 days. The nymphal mortality on the tested prey varied from 0% in *P. humuli* to 14.3% in *D. plantaginea*.

Key words: *Orius majusculus*; nymphal development; prey suitability; aphids, biological control

Species of the genus *Orius* are generally polyphagous predators of spider mites, thrips, aphids, psyllids, whiteflies, lepidopteran eggs and small insect larvae. *Orius majusculus* (Reuter, 1879) is a common species with transpalearctic distribution. It is known all over Europe including Great Britain and southern Scandinavia. In addition to Europe, it is found also in northern Africa, Asia Minor and central Asia (WAGNER 1952; PÉRICART 1972).

The first spontaneous occurrence of *O. majusculus* in greenhouses using biological control of pests, was reported in Holland by SCHREUDER and RAMAKERS (1989). In the Czech Republic this species was found by JINDRA *et al.* (1991) in greenhouses in which biological control on cucumbers was conducted. FEJT (pers. comm.) observed the replacement of introduced predatory bugs *Orius insidiosus* (Say) by *O. majusculus* on cucumbers in greenhouses; *O. majusculus* occurred naturally from the surrounding environment.

Development of *O. majusculus* was studied by many authors who used different prey species and different temperature regimes (ALAUZET *et al.* 1990, 1992; FISCHER *et al.* 1992; HUSSEINI *et al.* 1993; TOMMASINI & NICOLI 1994; SENGONCA & SCHADE 1996; HEJZLAR & KABÍČEK 1998). Aphids are often used as a prey for some *Orius* species in laboratory experiments and rearing. *Myzus persicae* (Sulzer) was used by FRESCATA *et al.* (1994) for rearing *Orius laevigatus* (Fieber) and by NAKATA (1995) for *Orius sauteri* (Poppius). Two aphid species, *Aphis gossypii* Glover and *Schizaphis graminum* (Rondani) were used as a prey for *O. insidiosus* (BUSH *et al.* 1993); while *A. gossypii*, and *M. persicae* and *Metopolophium dirhodum* (Walker) were utilised for feeding *Orius minutus* (L.) (LÜTTGE & SELL 1994). Aphids *Rhopalosiphum padi* (L.) (ALAUZET *et al.* 1990, 1992) and *Acyrthosiphon pisum* (Harris) (HEJZLAR & KABÍČEK 1998) were used as a prey for *O. majusculus*.

However, not all aphid species are suitable as a prey for anthocorid bugs. HEITMANS *et al.* (1986) found that *Aphis pomi* (De Geer) is a less suitable prey for *Orius vicinus* (Ribaut), since only young nymphal stages of this predator had sucked on these aphids. ANDERSON (1962) observed a high variation in the rates of development and reproduction of six *Anthocoris* spp. when fed with a range of prey species. Thus *Aphis fabae* Scopoli was suitable as a prey only for *Anthocoris gallarum-ulmi* (De Geer), but poorly suitable for *Anthocoris nemorum* (L.), and unsuitable for four other *Anthocoris* species. By contrast, RUTH and DWUMFOUR (1989) reported lower suitability of *A. fabae* for A. *gallarum-ulmi* because of prolonged nymphal development time. The present laboratory study has been conducted to investigate the possibility of *O. majusculus* to develop and prey on some aphid species that are common on apple trees, hops and currants.

MATERIAL AND METHODS

Predator Rearing: The laboratory stock of *O. majusculus* was initiated from adults collected on trees of *Prunus* sp. in Prague-Suchdol at the beginning of May 1997. The basic stock was maintained in a special jar (volume 5 l) covered with fine nylon gauze. Pieces of crumpled paper were added to provide hiding places. This culture was kept in a climatic chamber at 25 ± 1°C and 75 ± 5% RH, with a photoperiod of 16L:8D. UV-sterilized eggs of *Ephestia kuehniella* Zeller were used three times a week to feed adult bugs in the basic stock. Twigs with leaves of *Pelargonium peltatum* were used as an oviposition substrate, and exchanged twice a week. Twigs with deposited eggs were placed in a small plastic container into which, as in the basic stock, pieces of crumpled paper were added. The nymphs were fed two to three times a week with *E. kuehniella* eggs.

Source of Prey Species: The *E. kuehniella* eggs were obtained from our laboratory culture. Adults were placed in a special container for oviposition, and eggs were collected every day. UV radiation was used to kill the embryos and eggs were stored in a refrigerator at 4°C. *A. pomi* and *Dysaphis plantaginea* (Passerini) were collected from an apple orchard in which chemical treatments had not been used. Likewise, *Phorodon humuli* (Schrank) and *Aphis schneideri* (Börner) were collected from field crops that had been cultivated without the use of chemical treatments.

Study of Nymphal Development: All experiments were conducted in a climatic chamber at 25 ± 1°C and 75 ± 5% RH, with a photoperiod of 16L:8D. Newly hatched nymphs (max. 2 hours old) were carefully placed and confined individually into small plastic containers (35 mm in diameter, approx. 10 cm^3 volume). The opening in the container lid was 20 mm in diameter and was covered with fine nylon gauze. The prey was supplied every day. All stages of aphids were used. A small piece of artificial sponge in each container was kept wet, ensuring that the bugs had an option to suck water. Individual nymphs were checked daily for development and survival. The presence of nymphal exuvia was used as the evidence of moulting. The total nymphal development time was evaluated by the analysis of variance (ANOVA) using the SAS system for Windows 6.12, DUNCAN's multiple range test.

RESULTS AND DISCUSSION

The predatory bug *O. majusculus* is able to complete its nymphal development on the tested aphid species. The results, outlined in Table 1, show that the duration of the fifth nymphal stage of *O. majusculus* was always the longest. The second longest duration of the nymphal stage was recorded in the fourth instar and the shortest one was the second instar. The differences in the total nymphal development times between males and females are given in Table 2. The nymphal development time of females was longer than that of males in all cases, in *A. pomi* by more than 1 day. Recorded differences between males and females are not significant (Duncan's test $P < 0.05$).

The longest total nymphal development was on *D. plantaginea* (15.3 days) and in *A. pomi* (15.3 days). The nymphal development on *A. schneideri* was nearly one day shorter (14.5 days), and the fastest nymphal development was recorded *on P. humuli* (13.8 days). The durations of the total nymphal development times of *Orius majusculus* on *A. pomi* and *D. plantaginea* are significantly longer than on *A. schneideri* and *P. humuli* (Duncan's test $P < 0,05$).

The most suitable prey for *Orius* species, with respect to the development time, appears to be some lepidopteran eggs. The fastest nymphal development time on eggs of *E. kuehniella* at 25°C was recorded by FISCHER *et al.* (1992) – 11.1 days, similarly by TOMMASINI and NICOLI (1994) – 11.1 days, ALAUZET *et al.* (1990) found 12.7 days. HEJZLAR and KABÍČEK (1998) determined the duration of nymphal development on *Sitotroga cerealella* (Olivier) eggs as 12.5 days. In this comparison, the nymphal development times of the tested aphid species are longer within a range of 1.3 to 4.2 days, thus indicating that this type of prey is less suitable. BUSH *et al.* (1993) recorded longer development time for nymphs of *O. insidiosus* when fed diets of *A. gossypii* and *S. graminum*, than for nymphs provided with *H. virescens* eggs. Also, ALAUZET *et al.* (1990) found longer nymphal development time by *O. majusculus* fed with *R. padi* (16.0 days at 25°C). By contrast, HEJZLAR and KABÍČEK (1998) reported that the duration of nymphal development of *O. majusculus* reared on *A. pisum* was only 11.9 days (at 25°C).

The nymphal mortality on the tested aphid species varied from 0% on *P. humuli* to 14.3% on *D. plantaginea*. The recorded mortality is not high in comparison with the

Table 1. The nymphal development of *Orius majusculus* reared on different aphid species (in days)

Prey	*n*	L1	L2	L3	L4	L5	Total		Mortality (%)
A. pomi	26	2.7 ± 0.4	1.9 ± 0.2	2.3 ± 0.4	3.2 ± 0.5	5.2 ± 0.5	15.3 ± 1.0	a	11.5
A. schneideri	27	2.6 ± 0.5	1.7 ± 0.4	1.9 ± 0.2	2.8 ± 0.4	5.2 ± 0.5	14.5 ± 1.0	b	3.7
D. plantaginea	14	2.8 ± 0.3	2.0 ± 0.3	2.1 ± 0.2	3.1 ± 0.2	5.3 ± 0.4	15.3 ± 0.8	a	14.3
P. humuli	25	2.4 ± 0.5	1.8 ± 0.3	2.0 ± 0.1	2.8 ± 0.4	4.8 ± 0.3	13.8 ± 0.8	b	0.0

Means followed by the same letter are not significantly different ($P < 0.05$) by Duncan's multiple range test

Table 2. Males and females: nymphal development of *Orius majusculus* reared on different aphid species (in days)

Prey	Sex	*n*	L1	L2	L3	L4	L5	Adult	
A. pomi	F	14	2.8 ± 0.4	1.9 ± 0.2	2.4 ± 0.5	3.4 ± 0.6	5.4 ± 0.6	15.7 ± 0.8	a
A. pomi	M	9	2.6 ± 0.5	2.0 ± 0.2	2.2 ± 0.4	3.0 ± 0.2	4.9 ± 0.4	14.7 ± 0.8	ab
A. schneideri	F	12	2.6 ± 0.5	1.8 ± 0.4	2.0 ± 0.2	2.8 ± 0.4	5.3 ± 0.7	14.7 ± 0.9	ab
A. schneideri	M	14	2.6 ± 0.5	1.7 ± 0.4	1.9 ± 0,2	2.8 ± 0.3	5.1 ± 0.3	14.3 ± 0.8	bc
D. plantaginea	F	7	2.9 ± 0.2	2.1 ± 0.5	2.1 ± 0,2	3.1 ± 0.2	5.4 ± 0.5	15.7 ± 0.8	a
D. plantaginea	M	5	2.8 ± 0.3	1.8 ± 0.3	2.0 ± 0.0	3.0 ± 0.0	5.2 ± 0.3	14.8 ± 0.6	ab
P. humuli	F	12	2.6 ± 0.5	1.8 ± 0.4	2.1 ± 0.2	2.9 ± 0.3	4.8 ± 0.4	14.2 ± 0.9	bc
P. humuli	M	13	2.2 ± 0.3	1.9 ± 0.3	1.9 ± 0.1	2.8 ± 0.5	4.9 ± 0.3	13.5 ± 0.6	c

F = female; M = male
Means followed by the same letter are not significantly different ($P< 0.05$) by Duncan's multiple range test

results obtained at the same temperature of 25°C by several other authors. ALAUZET *et al.* (1992) reported the nymphal mortality of *O. majusculus* on different prey species (24–35%), FISCHER *et al.* (1992) on eggs of moth *E. kuehniella* (26%), HUSSEINI *et al.* (1993) on mite *Tyrophagus putrescentiae* Schrank (9.7%) and on thrips *Frankliniella occidentalis* (Pergande) (20.7%), and TOMMASINI and NICOLI (1994) on *E. kuehniella* eggs (59.7%). HEITMANS *et al.* (1986) found that nymphs of *O. vicinus* did not complete their development on *A. pomi* and they all died.

The results obtained by this study show that the offered aphid species can be successfully attacked by all nymphal stages of *O. majusculus* and, in spite of the prolonged nymphal development time, the nymphal mortality is not high. These results give a good approximation of the ability of *O. majusculus* to prey on aphids under field conditions. However, in order to evaluate this ability, more field experiments will have to be conducted.

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Souhrn

HEJZLAR P., KABÍČEK J. (2000): **Nymfální vývoj dravé ploštice** *Orius majusculus* (Reuter) (Heteroptera: Anthocoridae) **chované na čtyřech druzích mšic**. Plant Protect. Sci., **36**: 91–94.

Nymfální vývoj dravé ploštice *Orius majusculus* byl sledován na čtyřech druzích mšic při 25 ± 1 °C, 75 ± 5% relativní vzdušné vlhkosti a fotoperiodě 16 : 8 (světlo : tma). Nejkratší nymfální vývoj byl zjištěn na *Phorodon humuli* (13,8 dní), na *Aphis schneideri* trval 14,5 dní a nejdéle se vyvíjely nymfy na *Aphis pomi* (15,3 dní) a na *Dysaphis plantaginea* (15,3 dní). Mortalita nymf se na testovaných druzích potravy pohybovala v rozmezí od 0 % na *P. humuli* do 14,3 % na *D. plantaginea*.

Klíčová slova: *Orius majusculus*; nymfální vývoj; vhodnost potravy; mšice; biologická ochrana

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